

XXVI.—*Further Observations on Kammlplatten, and Note on Ctenoptychius pectinatus, Ag.* By THOMAS STOCK, Natural-History Department, Museum of Science and Art, Edinburgh*.

[Plate VIII. figs. 1-4 a.]

MR. T. P. BARKAS, F.G.S., has, with great kindness, allowed me to examine the entire series of *Kammlplatten* contained in his cabinet. Three of them are of interest, and deserve careful description.

No. 6† (Plate VIII. fig. 1, nat. size, and fig. 1 a, twice nat. size). Length 11 lines; originally it was somewhat longer. Lamella 4 lines, greatest breadth 2 lines; convex on the upper surface, concave on the lower. The pectination is very fine. Along the middle line there is a series of about eighteen minute punctures. The handle is noticeable for its great relative length; along two thirds of its course it is directed towards the pectinated edge of the lamella; it then bends away from it at a very obtuse angle till it is cut off by the edge of the slab. Its exposed margin is fringed by a very narrow and slightly raised border (see Pl. VIII. fig. 1 a), which, when examined by the lens, is seen to be broken up into a series of coarse denticulations, which pass at intervals into more or less prolonged ridges. There are dubious traces of a border on the opposite margin, seen in the matrix where the extremity has been broken away.

Horizon. Low-Main seam, Coal-measures, Northumberland.

Locality. Newsham.

Collection of Mr. T. P. Barkas, F.G.S.

No. 7 (Pl. VIII. fig. 2, nat. size, and fig. 2 a, twice nat. size). Length 4 lines; greatest diameter of the lamella 1 line. The lamella is pectinated along the lower two thirds of its margin; the denticles are about seventeen in number; they are the marginal prolongations of striæ, whose origin can be traced back to an indistinct ridge which is continuous with that of the handle to be described. The striæ and their denticular terminations all take a parallel but distinctly oblique direction. The handle (see Pl. VIII. fig. 2 a) is short ($1\frac{1}{2}$ line),

* The first part of this communication was read before the Edinburgh Geological Society, Jan. 19, 1882.

† The numbers are continuous with those of the preceding paper on the same subject, 'Annals,' Aug. 1881, p. 95.

broad, and divided longitudinally into two areas; the one is formed by a depression, which follows the curve of the handle to its junction with the pectinated margin of the lamella, the other by an elevated ridge, which occupies the remainder of the surface.

Same horizon, locality, and collection as the last.

No. 8 (Pl. VIII. fig. 3, nat. size, and fig. 3 *a*, twice nat. size). Length 5 lines; greatest width of the lamella $1\frac{1}{2}$ line. The lamella and handle form distinct areas, as in all the specimens so far observed. The lamella is feebly denticulated on one margin. The denticles are about eleven in number, more horizontally directed than in No. 7, and appear to be the slightly prolonged terminations of striæ, whose course cannot be observed very far back. The lamella, like those of No. 6 and No. 2 of the preceding paper*, and in the same relative position, is marked by a series of about fifteen punctures. The handle (see Pl. VIII. fig. 3 *a*) is short (2 lines), broad, and thick. It rises gradually from the plane of the lamella, and terminates abruptly in an elevated polished boss; close to but beneath it there is a rather deep depression; and also close to it, but rather to the underside of it, a much shallower depression can be detected by the aid of the lens. On the handle, near where it enters the lamella, there are a few coarse striæ, which terminate about halfway across towards the non-pectinated aspect of the specimen in slightly elevated denticular prominences. Obscure indications of these striæ and their denticular terminations can be observed along nearly the whole of the length of the handle.

Same horizon, locality, and collection as the preceding.

A further examination of the black-band ironstone of Burgh Lee, near Edinburgh, has resulted in the discovery of several specimens, referable for the most part to the form described as No. 5 in the preceding paper. One of them, however, is of sufficient interest to be worthy of separate description.

No. 9 (Pl. VIII. fig. 4, nat. size, and fig. 4 *a*, twice nat. size). Length 5 lines; greatest width of the lamella $1\frac{1}{2}$ line. The lamella is damaged along the denticulated (?) margin, so that it is impossible to say what was its original shape. The handle is 3 lines long, much broader than that of the rest of my specimens from the same locality, long in proportion to the entire length of the plate, and tapering to a rounded extremity. A prominent elevation occupies the centre of the handle, is broadest where it enters the lamella, and gradually tapers to a fine point in the opposite direction.

* *Op. jam cit.* p. 94, pl. vi. fig. 2.

Horizon. Carboniferous Limestone series.

Locality. Burgh Lee, near Edinburgh.

In my own collection.

It was known from the specimens described by Prof. Fritsch that the Bohemian *Kammlatten* were concave on one surface and convex on the opposite, corresponding with similar concavities and convexities on the next apposed plates of the series. The British specimens are constructed on the same plan. Some of them, however, give evidence of the existence of special provisions by which the plates were more closely united with each other. These articulatory specializations are not very strongly developed in all of the specimens; yet they amount in some to a considerable degree of complexity of type. On several of them (Nos. 2, 6, 7, and 8) there are minute punctures or short transverse scratches occurring with uniformity of position along the exposed surfaces of the lamellæ. These possibly fitted into corresponding prominences on the concave areas of the lamellæ of the succeeding plates, though I have not been able to verify this by observation, as nearly all the plates that I have seen have been presented with their convex sides upon the slabs. On the handle, however, of the plate described as No. 8 in this communication (Pl. VIII. fig. 3 *a*) there are striæ terminating at about the centre in denticular prominences, which probably fitted into shallow excavations on the concave area of the handle next in the series. Again, in the same specimen, the two pits near the end of the handle and the boss-like termination of the handle itself probably fitted into elevations and a depression on corresponding parts of the next plate. In this specimen, therefore, there is a high degree of articulatory specialization. In No. 7 (Pl. VIII. fig. 2 *a*) it is of a more simple character, but very distinct; for the rather deep groove and elevated ridge on the handle must have fitted into a similar ridge and groove on the next plate. Again, in No. 9 (Pl. VIII. fig. 4 *a*), there is a well-developed elevation upon the handle, which, there is no reason to doubt, fell into a corresponding hollow on the plate next in succession. In No. 6 (Pl. VIII. fig. 1 *a*) there is the interesting peculiarity of a raised border, developed along one margin certainly, and possibly along the other, of the handle, which may be interpreted as an articulatory provision. Its function, however, is not perfectly clear.

Thanks to this series of detached plates, we obtain a little additional light as to the structure of the apparatus of which they were the parts. That this is not entirely sufficient to remove the doubt surrounding their affinities is tolerably clear;

nevertheless it appears to me that the view of the labyrinthodont origin of these bodies is more conformable with the facts of their structure (as I have endeavoured to describe and interpret them) than with any other "theory" that can at present be offered. Whatever may be their ultimate fate, the reference to *Ctenoptychius* may safely be disregarded. Prof. Fritsch has certainly contributed an interesting puzzle to science, the solution of which will no doubt be found as the rocks are made to yield up their fossil contents.

I regret that my specimens from Loanhead are not well suited for microscopical preparation.

Mr. John Ward, F.G.S., tells me that Kammplatten are found in the Staffordshire coal-field.

Mr. T. P. Barkas corrects* *Ctenoptychius marginalis*, Barkas, to *C. marginalis*, Ag. There appears to be a little doubt as to the authorship of this species, if species it is. It seems to have been first recorded in Portlock's Geol. Report on Londonderry &c., once at p. 461, from a list of fossils supplied by Capt. Jones, M.P., and again at p. 769; but, curiously enough, the authority is not appended in either case. It is omitted too from an interesting account of the genus recently published † by Mr. J. W. Davis, F.G.S.

Note on *Ctenoptychius pectinatus*, Ag.

[Plate VIII. figs. 5-17.]

THE fossils known as *Ctenoptychius pectinatus*, Ag., are pretty generally distributed throughout the Carboniferous Limestone and Calciferous Sandstone series of Midlothian. Specimens have been collected by the Scottish Geological Survey at Juniper Green, and from beneath St. Anthony's Chapel, in the Queen's Park, Edinburgh. They appear to occur sparingly (at any rate, few specimens have been collected) below the limestone of Burdiehouse, from which the type specimens came; but above that horizon they increase in frequency, reaching their greatest abundance in the strata worked for coal and ironstone along the line of country between the Venturefair colliery at Gilmerton and the pits at Glencorse. From these workings, and especially from Gilmerton and Loanhead, I have obtained, partly through the intervention of my friend Mr. W. T. Kinnear, a large number of specimens, which I could easily have increased if it had been worth while. An examination of this abundant material shows that, as Messrs. Hancock and Atthey long since

* "*Ctenoptychius* or Kammplatten,' 'Annals,' Nov. 1881, p. 350.

† 'Annals,' Dec. 1881, p. 424.

pointed out*, every gradation exists between the broad forms, which Agassiz called *C. denticulatus*, and the short, named by him *C. pectinatus*. I have endeavoured to represent (Pl. VIII. figs. 5-17)† a series which connects the two extremes. A consideration of the figures will show that there is a considerable range of variation, not only in the width of the specimens, but in the extent to which the roots are developed and the denticles pointed and fasciculated.

In the forms represented by figs. 6, 12, and 17, the denticles are blunt. In the specimen shown in fig. 12 and in one of those seen on the slab, fig. 17, the concave surface is represented; but in these cases the concavity is slight and the denticles are very little separated at their apices. The blunt appearance is not due to abrasion. The whole of the specimens in fig. 17 are bluntly denticulated, and presumably belonged to the same individual, the only instance of the kind that has as yet occurred to me. It seems more reasonable to believe that all of these obtuse forms are indicative of individual variation rather than of specific difference. The greatest amount of fasciculation may be observed on the fine example shown at fig. 16, the denticles of which tend to arrange themselves in groups of twos and threes. The specimen is somewhat fractured; and I have slightly restored the fang-like processes. In fig. 13 there is very little, if any, fasciculation. In fig. 15, an imperfect specimen, the free area is low and very straight. Figs. 10 and 14 represent examples of the ordinary type, but viewed on their concave aspects. Fig. 10 has an abnormally prolonged base. Most of the specimens give evidence of the production of the covered area into fang-like extensions.

Messrs. Hancock and Atthey suggested‡ that these plates might be dermal appendages. The more generally received view appears to be that they are, as Agassiz thought, Selachian teeth. The unusual prolongation of the base into roots or fangs is nevertheless paralleled in e. g. *Polyrhizodus*, a Selachian tooth; and the histological characters do not point decisively either way.

* "Notes on the Remains of some Reptiles and Fishes from the Shales of the Northumberland Coal-field," Nat. II. Trans. Northumberland and Durham, vol. iii. part i. p. 115 (1869).

† The figures are all of the natural size, and are drawn from specimens obtained at Loanhead in the Carboniferous-Limestone series.

‡ *Loc. cit.*